



# CITY OF LODI COUNCIL COMMUNICATION

**AGENDA TITLE:** Adopt Resolution Authorizing City Manager to Execute Task Order with Treadwell & Rollo for Groundwater Modeling Work for Lodi Central Plume PCE Remediation Design and Appropriating Funds (\$125,000)

**MEETING DATE:** March 21, 2007

**PREPARED BY:** Public Works Director

**RECOMMENDED ACTION:** Adopt a resolution authorizing the City Manager to execute a task order with Treadwell & Rollo for groundwater modeling work for Lodi Central Plume PCE remediation design and appropriating funds as shown below.

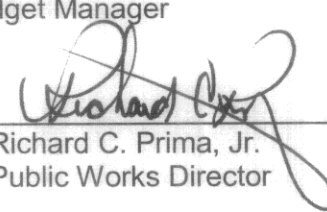
**BACKGROUND INFORMATION:** As presented to the City Council in December 2006, staff has been working with our consultants, Treadwell & Rollo (T&R), to formulate a plan to utilize both existing and new production wells as a major part of the PCE/TCE remediation. There are a variety of technical issues that need to be resolved in order to evaluate and develop this concept in sufficient detail to estimate costs and make a strong proposal to the Regional Water Quality Control Board.

T&R has proposed to develop an electronic groundwater model that will allow us to test various pumping configurations, both in terms of number of wells and capacity. In addition, the model has the capability of creating pictorial simulations of the plumes and the effects of pumping to aid in both technical evaluation as well as public presentations. (See attached proposal.) The requested appropriation includes the amount stated in the proposal (\$109,400) plus a contingency for additional work and/or meetings, if necessary.

**FISCAL IMPACT:** Doing this work at a comparable level of accuracy and certainty without the model would be cost prohibitive, if not impossible. Without the model, we would rely on judgment and past experience to make our best guesses as to well location and capacity which could either be overly conservative resulting in higher costs, or inadequate, in which case we would need to add additional wells in the future.

**FUNDING AVAILABLE:** Central Plume Trust Fund (\$125,000)

  
Kirk Evans, Budget Manager

  
Richard C. Prima, Jr.  
Public Works Director

RCP/pmf  
Attachments

cc: Steve Schwabauer, City Attorney  
Charlie Swimley, Water Services Manager

Wally Sandelin, City Engineer  
Phil Smith, Treadwell & Rollo

**APPROVED:**   
Blair King, City Manager

1 March 2007  
Project: 3923.12

Mr. Richard Prima  
Public Works Department  
City of Lodi  
221 West Pine Street  
Lodi, California 95240

Subject: Proposed Scope, Schedule, and Budget  
City Groundwater Model  
Lodi, California

Dear Mr. Prima:

The City of Lodi (City) is currently considering the development of a comprehensive, City-wide groundwater remediation program that will likely center on the remediation of significant contaminant source areas, combined with the use of relatively high-capacity production wells and possibly lower capacity extraction wells. This approach holds promise to significantly reduce both capital and long-term operations and maintenance costs associated with the groundwater remediation program by using treated groundwater rather than disposing it, and by approaching the contaminant plumes as a single remediation program, not five separate plume-specific programs.

Preliminary conversations with the Regional Water Quality Control Board (RWQCB) and other state regulatory agencies suggest that this approach will be acceptable provided that the City can demonstrate that groundwater contamination is being adequately mitigated, and in a timely manner. The RWQCB has, in the past, expressed the opinion that mid-plume extraction wells may be required to expedite remediation, although details of any plan have not yet been formulated or discussed with the RWQCB.

Major questions that will likely be asked by the regulators and possibly by the community at large include the following:

- Is groundwater contamination being adequately contained and removed?
- Is the time line for attaining “clean-up” appropriate?
- Does an integrated groundwater extraction remediation program result in the movement of contamination to portions of the aquifer currently not impacted by contamination?
- Does an integrated remediation program that relies on significant groundwater extraction result in additional over-draft of the aquifer, and how would this impact long-term groundwater resources planning for Lodi and possibly Stockton?

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- Can the City “pulse” extraction wells that are used for both remediation and water supply (as supply wells are currently used) without a negative impact on the groundwater remediation program?
- What are the financial risks and benefits associated with this remediation program?

To address these questions and prepare a City-wide groundwater remediation program that will be acceptable to the regulatory agencies, T&R has prepared this proposal to develop a flexible, multipurpose three-dimensional City-wide groundwater flow model of the hydrogeologic regime underlying Lodi that can be applied to the following groundwater cleanup and management tasks:

- Evaluate various contaminant source area remedial alternatives, such as soil vapor extraction, the use of injected media to expedite dechlorination, groundwater extraction, etc.;
- Evaluate remedial alternatives for the Central and potential impact to other plumes, including optimizing extraction well designs and locations;
- Develop a City-wide groundwater monitoring program, optimizing the location of new monitoring wells;
- Evaluate modifications to and assist in the management of the City’s groundwater supply system including new well design, wellhead protection, groundwater recharge basins, water recycling, aquifer storage and recovery, mitigating potential overdraft, and optimizing system operation.
- Prepare GIS graphics using model results that clearly communicate remediation and water use issues to Lodi citizens, City Council and the regulatory community;
- Demonstrate and support groundwater containment and compliance proposals to the RWQCB in accordance with California legislation AB303, SB1938, and AB3030;
- Improve data coordination with the Northeastern San Joaquin Groundwater Basin Groundwater Management Plan; and
- Integrate groundwater cleanup and supply management.

We anticipate that the model will cover the area from the Mokelumne River south to at least a half mile south of Harney Lane, approximately 0.75 miles west to Lower Sacramento Road, and east to the CCT railroad. As the focus of the model is groundwater remediation, varying degrees of detail will be input to different portions of the model. Initially, the Central Plume Area will contain the most detail to focus on evaluating and designing extraction scenarios that include source area remediation, the use of production wells and possible mid-plume, lower yield

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extraction wells. Additional detail would be added to the Busy Bee, Northern, South Central/Western, and Southern plume areas as needed to scope and design remedial approaches for those contaminant plumes. The outer areas of the model would have minimal detail and serve as flow boundaries. The model will include a contaminant fate and transport component to evaluate the migration of contaminants over time.

The proposed technical scope and estimated costs for model development are included in the attachment. Our approach will provide flexibility to initially focus on specific issues such as the Central Plume containment while providing a platform for broader planning for City-wide groundwater remediation and groundwater supply and management. By phasing the model construction tasks, the City can determine at several junctures how far to take the model. The model can evolve over time as additional data are obtained and uses are identified to support the City's needs.

Finally, we appreciate your need to use the City's financial resources effectively and wisely. We share that desire, and believe that the groundwater flow model will be instrumental in achieving that goal. The true value of this model will be in the time saved in:

- Rapidly evaluating multiple remedial alternatives and pumping scenarios,
- Increasing the effectiveness of the chosen remedial alternatives,
- Demonstrating and graphically conveying a high level of understanding of the hydrogeologic regime and its response to pumping and various remedial alternatives, and
- Providing the City with a tool that will integrate operating the overall groundwater remediation program and managing water supply resources.

We appreciate the opportunity to assist the City of Lodi and will contact you in a few days to discuss this proposal.

Sincerely,  
TREADWELL & ROLLO, INC.



Philip G. Smith, CPGS, REA II  
Vice President

## **1.0 GROUNDWATER MODELING TECHNICAL APPROACH**

### **1.1 Data Compilation/ Evaluation Conceptual Hydrogeologic Model Development**

Prior to development of the groundwater flow model, data (much of which T&R currently has) needed for model input will be compiled, including but not limited to:

- Geologic and topographic maps, and publications pertaining to hydrogeologic features and boundaries, including faults, bedrock, and surface water bodies for establishing the model domain;
- Stratigraphic data including supply well, monitoring well and extraction well lithologic and geophysical logs for wells and test borings, and associated well construction details;
- Historical steady-state and pumping groundwater level data to create a table with the water levels and construct potentiometric maps for dry/wet of years;
- Existing hydrogeologic cross sections ;
- Aquifer parameters such as hydraulic conductivity, transmissivity, and storativity from the Well 0-6R and other pumping tests and supply well specific capacity tests;
- Review of existing regional groundwater model for model input parameters;
- Historical production data for supply wells, irrigation wells and other extraction wells including operational data as available;
- Historical water quality data;
- Recharge data for Lodi Lake, and flow and recharge data for Mokelumne River and White Slough Data including any gauging station data, water quality data etc.; and
- Precipitation and irrigation data.

Much of these data is already available and can be compiled relatively quickly. It is anticipated that the remaining data can be rapidly obtained and summarized rapidly.

## 1.2 Model Development and Construction

T&R will use the compiled datasets to develop a conceptual hydrogeologic model of groundwater flow conditions for the model domain. The conceptual model, which will be a three-dimensional representation of the groundwater flow system, will be evaluated on the basis of the following components:

- Stratigraphic Analysis;
- Pumpage, Recharge and Discharge Analysis;
- Boundary Condition Analysis;
- Aquifer Parameter Estimation Analysis; and,
- Water Budget Analysis.

A 3-D numerical groundwater flow model will be constructed using the conceptual model and the graphical interface modeling platform **Groundwater Modeling System (GMS<sup>TM</sup>)**. The groundwater flow simulations will be performed using **MODFLOW2000**, the latest version of the U.S. Geological Survey modular finite-difference groundwater flow code. **MODPATH** will be used to simulate the particle-tracking and capture zones of the supply / extraction / remediation wells. Grid spacing of the model will be varied to more accurately simulate production wells, observations wells, groundwater flow, and particle tracking, without “over-modeling” the study area.

## 1.3 Model Calibration – Steady State

Following model construction, the model will be calibrated to observed groundwater elevations until a sufficient level of correlation between predicted and observed groundwater elevations is established. During this process, model parameters like hydraulic conductivity, aquifer/ Mokelumne River interaction, aquifer/surface water interaction, and recharge from precipitation/infiltration will be adjusted to improve the correlation between predicted and observed water levels. This task will be facilitated using a parameter estimation package (PEST) simulations to enhance the statistical fit to observed water level data. The initial calibration will be conducted under steady-state conditions until calibration goals are achieved.

## 1.4 Transient Model Calibration/Verification

Following completion of the model calibration phase, transient calibration simulations will be performed. During this phase, pumping and recharge input will be varied with time based on field data, and predicted water levels for each time step will be compared to observed water levels for correlation. For model verification, the constant rate aquifer test performed at water supply Well-06R will be simulated using the groundwater flow model. If other similar well data is available, additional verification runs can be performed. Predicted and observed pumping responses observed during the constant rate aquifer test will be compared to assess whether the model is accurately simulating

pumping in the vicinity of the extraction wells. If the initial correlation between predicted and observed pumping responses is insufficient, model input parameters will be adjusted and the verification process will be repeated. This iterative process will continue until an acceptable match of calibration and verification data has been achieved.

### **1.5 Sensitivity Analysis**

Sensitivity analysis assesses how the model responds to variations in individual input parameters, and the uncertainty of model predictions. During the sensitivity analysis phase the least defined model parameters, such as natural and artificial boundary conditions, unverified pumping rates and poorly constrained aquifer parameters will be varied in a systematic way. Predictive simulations will be repeated with the adjusted model parameters to assess the effects of parameter adjustments on predicted performance.

### **1.6 Predictive Simulations**

The initial predictive model simulations will be of the Central Plume source area dual-phase extraction system and off-site groundwater plume remedial alternatives. These simulations will be used to evaluate the effectiveness of a full-scale dual phase system and whether a single high-capacity production well in the vicinity Well-06R will adequately capture contamination without the use of up-gradient extraction wells. The potential effect of the Central Plume remediation on the Busy Bee plume will be evaluated. Additional simulations may include multiple extraction well scenarios for the South Central/Western plume, extraction and source area remediation in the Northern Plume Area, and focused in situ remediation in the South Plume. The estimated cost at this task (Section 3.0) includes time to prepare flow and transport simulations of contaminant mitigation over time, and time to prepare a limited number of documents for City use in public presentations.

### **1.7 Technical Memorandum**

A technical memorandum will be prepared at the completion of the Central Plume simulations documenting the model development process and results. Results of model calibration, model verification and sensitivity analysis will be presented to demonstrate the ability of the model to predict flow conditions. Results of model calibration, model verification, sensitivity analysis, and predictive simulations will also be presented graphically. Key decisions made during model development will be justified. Results of predictive simulations will be summarized. Recommendations for additional modeling activities made, based on the success of this effort.

### **1.8 Meetings**

Prior to start of the groundwater modeling activities, an initial meeting will be held with the City staff to discuss any pertinent issues related to the Project. In addition, all relevant City documents pertaining to the Project will be provided at this meeting. The City will periodically be updated on the progress of the model through brief project updates. Following completion of the groundwater modeling activities, a meeting will be



conducted with the City staff to discuss and present the completed model and predictive results. Additionally, a meeting will also be conducted with the RWQCB to discuss and present the completed model and predictive results. Three meetings with City and the RWQCB are anticipated as part of this task.

## **2.0 PROPOSED SCHEDULE**

T&R estimates that the scope of services can be completed within approximately two to three months after receiving approval to proceed. A technical memorandum will be submitted to the City following completion of groundwater flow model development activities. T&R will adjust the proposed schedule within reasonable limits to accommodate City needs.

## **3.0 ESTIMATED COST SUMMARY**

We propose to perform the work on a time-and-expense basis in accordance with terms similar to our Technical Services Task Order Agreement signed 19 May 2004 with the City of Lodi.

We have estimated the following costs for Tasks 1 through 8.

Task 1 – Data Compilation and Evaluation	\$ 5,000
Task 2 – Model Development and Construction	\$ 24,000
Task 4 – Model Calibration	\$ 12,400
Task 5 – Model Verification	\$ 5,700
Task 6 – Sensitivity Analysis	\$ 7,200
Task 7 – Predictive Simulations	\$ 30,000
Task 8 – Technical Memorandum	\$ 15,600
Task 8 – Meetings (3 meetings)	\$ 9,500
<b>TOTAL ESTIMATED COSTS</b>	<b>\$109,400</b>



RESOLUTION NO. 2007-46

A RESOLUTION OF THE LODI CITY COUNCIL  
AUTHORIZING THE CITY MANAGER TO EXECUTE  
TASK ORDER WITH TREADWELL & ROLLO, INC., FOR  
GROUNDWATER MODELING WORK FOR THE LODI  
CENTRAL PLUME PCE REMEDIATION DESIGN, AND  
FURTHER APPROPRIATING FUNDS

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NOW, THEREFORE, BE IT RESOLVED that the Lodi City Council hereby authorizes the City Manager to execute the Task Order with Treadwell & Rollo, Inc., for groundwater modeling work for the Lodi Central Plume PCE remediation design; and

BE IT FURTHER RESOLVED that funds in the amount of \$125,000 be appropriated from the Central Plume Trust Fund for this project (proposal amount of \$109,400, plus a contingency for additional work and/or meetings as necessary).

Dated: March 21, 2007

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I hereby certify that Resolution No. 2007-46 was passed and adopted by the City Council of the City of Lodi in a regular meeting held March 21, 2007, by the following vote:

AYES: COUNCIL MEMBERS – Hansen, Hitchcock, Katzakian, Mounce, and Mayor Johnson

NOES: COUNCIL MEMBERS – None

ABSENT: COUNCIL MEMBERS – None

ABSTAIN: COUNCIL MEMBERS – None

  
RANDI JOHL  
City Clerk

CITY COUNCIL

BOB JOHNSON, Mayor  
JOANNE L. MOUNCE  
Mayor Pro Tempore  
LARRY D. HANSEN  
SUSAN HITCHCOCK  
PHIL KATZAKIAN

CITY OF LODI  
PUBLIC WORKS DEPARTMENT

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BLAIR KING  
City Manager  
RANDI JOHL  
City Clerk  
D. STEVEN SCHWABAUER  
City Attorney  
RICHARD C. PRIMA, JR.  
Public Works Director

March 16, 2007

Treadwell & Rollo  
Mr. Phil Smith  
555 Montgomery Street, Ste. 1300  
San Francisco, CA 94111

SUBJECT: Adopt Resolution Authorizing City Manager to Execute Task Order with  
Treadwell & Rollo for Groundwater Modeling Work for Lodi Central Plume  
PCE Remediation Design and Appropriating Funds (\$125,000)

Enclosed is a copy of background information on an item on the City Council agenda of  
Wednesday, March 21, 2007. The meeting will be held at 7 p.m. in the  
City Council Chamber, Carnegie Forum, 305 West Pine Street.

This item is on the consent calendar and is usually not discussed unless a  
Council Member requests discussion. The public is given an opportunity to address  
items on the consent calendar at the appropriate time.

If you wish to write to the City Council, please address your letter to City Council,  
City of Lodi, P. O. Box 3006, Lodi, California, 95241-1910. Be sure to allow time for the  
mail. Or, you may hand-deliver the letter to City Hall, 221 West Pine Street.

If you wish to address the Council at the Council Meeting, be sure to fill out a speaker's  
card (available at the Carnegie Forum immediately prior to the start of the meeting) and  
give it to the City Clerk. If you have any questions about communicating with the  
Council, please contact Randi Johl, City Clerk, at (209) 333-6702.

If you have any questions about the item itself, please call me at (209) 333-6759.

*R. Prima*

for: Richard C. Prima, Jr.  
Public Works Director

RCP/pmf

Enclosure

cc: City Clerk